

ON THE GENERAL AND SPECIFIC NATIONAL
AND INTERNATIONAL NEED FOR METEOROLOGI-
CAL DATA FROM THE GREENLANDIC AREA.

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In the Icelandic Saga "Kongespejlet" from about 1250, we have found the oldest description of arctic meteorological conditions. It shows that the Vikings had a rather good understanding of arctic weather conditions, although it is a verbal and subjective description only. The first more scientific meteorological measurements in the arctic took place in the 19th century. Up to the beginning of this century observations was only made by enthusiastic scientists on expeditions, and not as part of a regular operational service.

In the twenties more permanent radio communication in the arctic were established, which performed communication duties as well as weather observations, and during World War 2 a net of meteorological stations were established in Greenland.

Based upon the technological development during the war, intercontinental commercial flight was made possible afterwards. We have to remember though that this traffic was based upon aircraft such as the DC4, which only could reach from the most western point in Europe (Shannon on Ireland) to the most eastern in North America (Gander on New Foundland), and then only under favourable weather conditions. Through the International Civil Aviation Organization, ICAO, the aeronautical services air ground communication, navigation and weather observations were coordinated and financially supported by member nations. Although the new aircraft still improved in range, meteorological data were still needed as the international air service pattern changed or expanded for example by the establishment of the transpolar flights.

During the past years, establishment of rapid communication lines based upon line of sight chains or satellite communication systems, and the use of large computers has created

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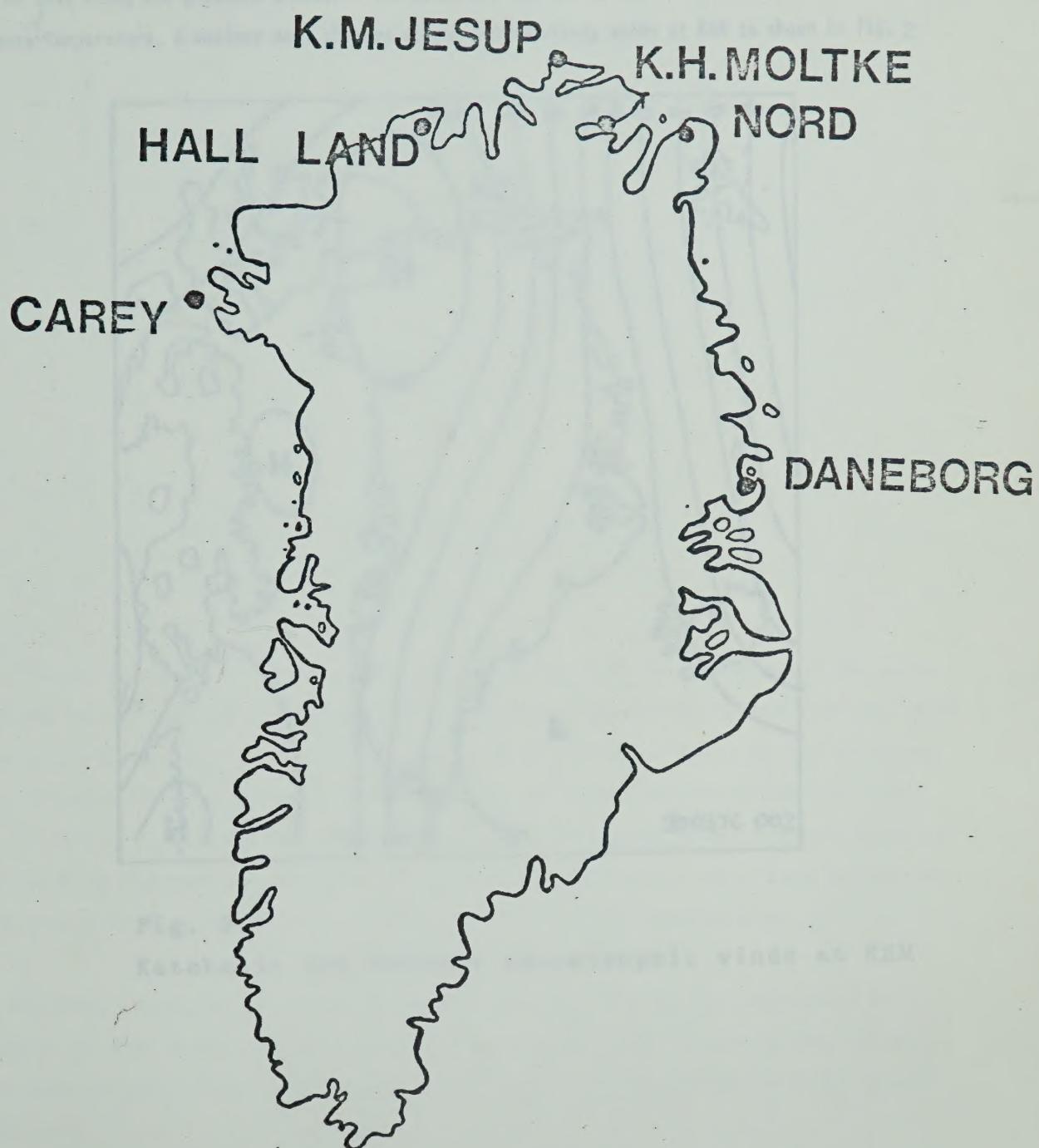
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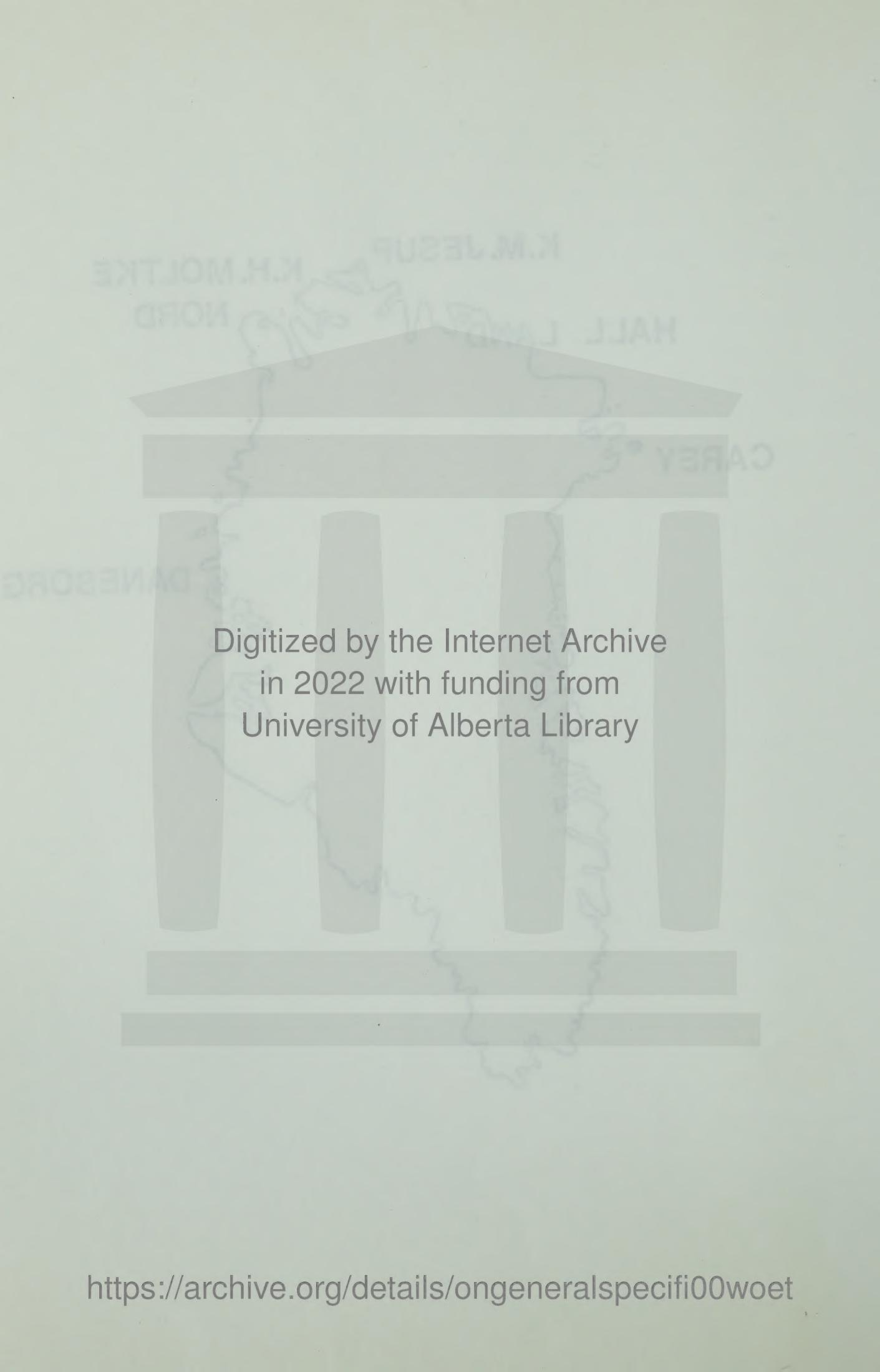
possibilities for achieving the maximum benefit from the established network of meteorological observatories, based upon numerical forecast models. The number of observatories is during same period decreasing, partly due to the fact that advanced communication systems operate automatically from unmanned stations, which give no possibility for the continuation of manual weather observations. The change from ~~fixed-wing aircraft~~ ~~the~~ propeller to jet aircraft provides longer range and higher operational altitudes. Accordingly, these are less dependence on meteorological conditions en route. This reduces ICAO's need or interest for giving financial support to arctic weather observing stations.

The industrial development of the arctic region - mining, oil production or prospecting, hydroelectric power stations - has changed the traffic pattern. These activities as well as the change in local labour conditions (industrial fishery instead of hunting) demand better meteorological services. In the same direction, the consciousness of the arctic environment as well as scientific studies (biological as well as physical as the study of the East Greenland Current) also demands meteorological data.

This demand can to-day realistic seen only be met by setting up automatic weather stations.

The manned station Nord was closed in 1972. In order to be able to continue the valuable climatological record of 20 years of almost unbroken data, a battery supported automatic climatological station, called Unmanned Geophysical Observatory - UGO - was installed at Nord in June 1972. A detailed description is given in ref. 1. In the following years, as seen on the map fig. 1 additionally UGO stations were established in Northern Greenland, and based upon climatological data it has been possible to analyse and reanalyse the meteorological conditions local as well as for the North Atlantic region.





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Katabatic winds in North Greenland are rather common. At Kap Harald Moltke (KHM) strong northwesterly surface winds, frequently occurring during the winter season, are extremely ageostrophic, blowing more or less along the pressure gradient. The winds are dry and nearly always accompanied with an increase of temperature. A weather map, showing strong northwesterly winds at KHM is shown in fig. 2

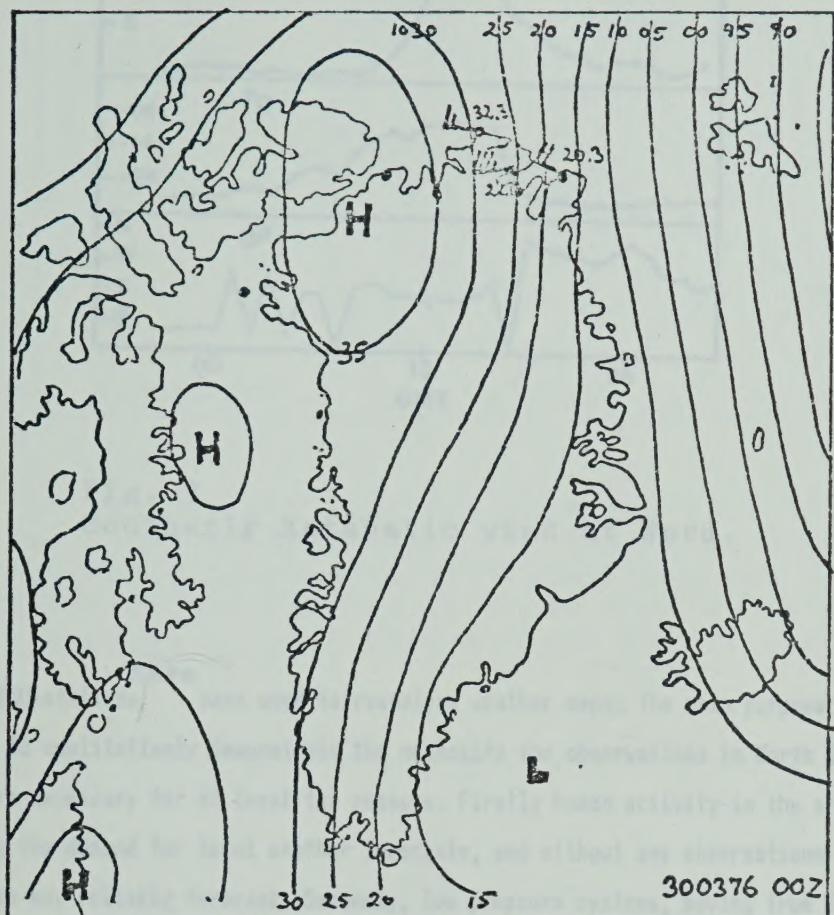


Fig. 2

Wind vectors from a weather map showing the weather at KHM in North Greenland.

Katabatic and extreme ageostrophic winds at KHM. The difference between the observed and the analyzed pressure at KHM has been investigated for a period of 315 days. Reasonably the pressure difference exceeds 10 mb. As example, when the pressure difference exceeds 10 mb as shown in Fig. 3. Fig. 3 shows the distribution of the pressure difference.

As another example a southerly katabatic wind at Nord is shown in fig. 3.

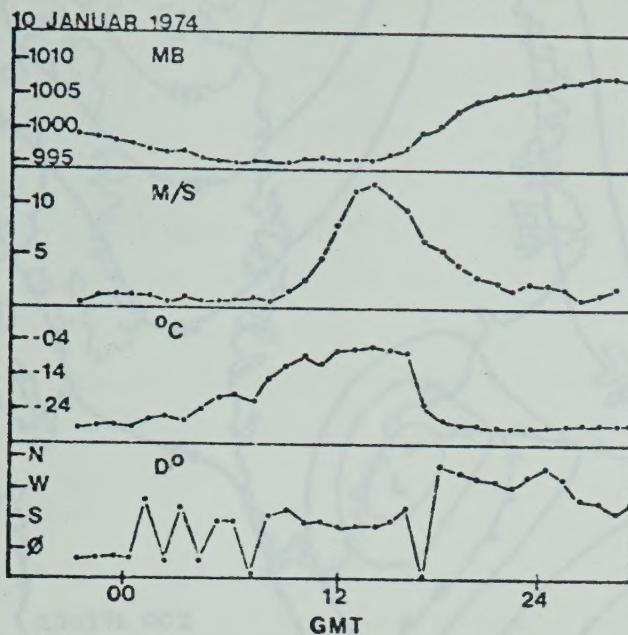


Fig. 3
Southerly katabatic wind at Nord.

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Data from the UGO-stations have been used to reanalyse weather maps. The main purpose of the reanalysis has been to qualitatively demonstrate the necessity for observations in North Greenland. These observations are necessary for at least two reasons. Firstly human activity in the area increases, thus increasing the demand for local weather forecasts, and without any observations it is hardly possible to make any reliable forecast. Secondly, low pressure systems, moving from North Greenland into the North Atlantic Ocean, and there radically changing the weather, may at times be overlooked because of the lack of meteorological information from the North Greenland area.

The difference between the observed and the analysed pressure at KHM has been investigated for a period of 515 days. Occasionally the pressure difference exceeds 10 mb. An example, where the pressure difference exceeds 10 mb is shown in fig. 4. Fig. 5 shows the distribution of the pressure differences.

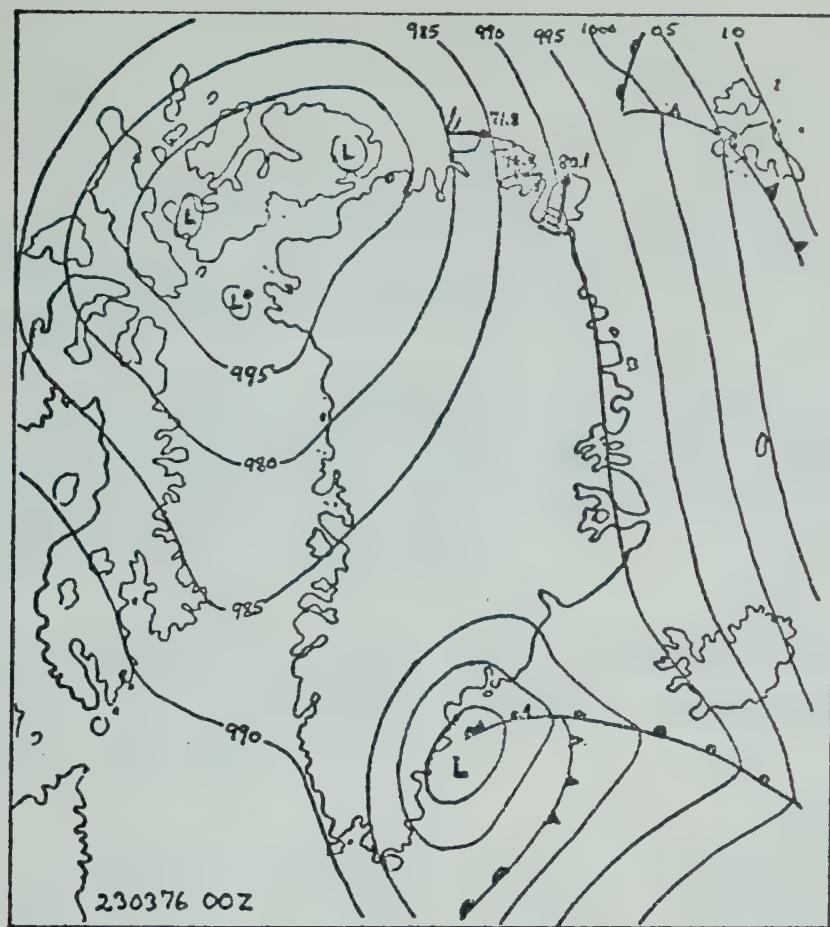


Fig. 4

The weather map analysis on March 23 1976 taken from the European Meteorological Bulletin, with UGO-observations differing considerably from the analysed values. The UGO-observations indicate that a low must be present somewhere between Nord and Kap Morris Jesup.

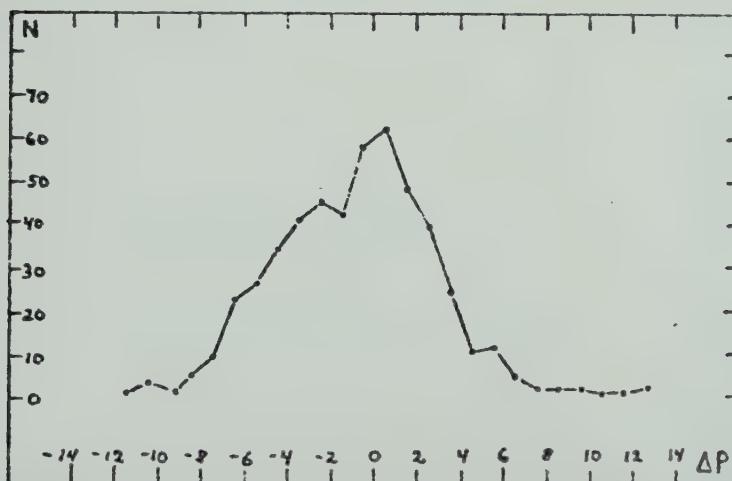


Fig. 5

Distribution of the pressure difference in mb at 00 GMT between the observed and the analysed pressure at KHM. N is the number of days with ΔP laying in the interval $[i, i+1]$ $i = \pm 1, 2, \dots$
The number of days examined is 515.

References

- (1) L. Kristensen and J. Taagholt, "UNmanned Geophysical Observatory in North Greenland", The Danish Meteorological Institute 1973, 80 pp.
- (2) G. Jensen, L. Kristensen, P. Dorph-Petersen and J. Taagholt, "Unmanned Geophysical Observatories in North Greenland 1972-1975", The Danish Meteorological Institute 1976, 93 pp.
- (3) L. Lysgaard, Danmarks Klima. Foreløbig oversigt. Det Danske Meteorologiske Institut. Meddelelser, No 19, 1969, 110 pp.
- (4) P. Dorph-Petersen, G. Jensen, L. Kristensen, N. Woetmann Nielsen, L. Rasmussen and J. Taagholt: "Automatic Meteorological Observations in Northern Greenland". Proceedings of the technical conference on Automatic Weather Stations. pp 18. Published on behalf of the COST Secretariat, September 1976.

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